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First Named
Inventor : Simon H. Corston-Oliver et al.

Appln. No.: 09/336,200

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For : SYSTEM FOR IMPROVING THE
PERFORMANCE OF INFORAMTION
RETRIEVAL-TYPE TASKS BY
INDENTIFYING THE RELATIONS OF
CONSTITUENTS

Docket No.: M61.12-0099

Group Art Unit: 2175
Examiner: T. N. Pardo

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RESPONSE

Commissioner for Patents
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4th DAY OF December 2003
Joseph R. Bell
PATENT ATTORNEY

Sir:

This is in response to the Office Action dated September 8, 2003. In the Office Action the Examiner rejected claims 1-6, 13-16, 23-35, 41, 43 and 62-66 and objected to claims 7-12 and 17-22. With this response no claims are amended. Reconsideration and withdrawal of the rejections are respectfully requested in view of the following remarks.

In item 4 of the Office Action the Examiner rejected claims 1-6, 13-16, 23-35, 41, 43 and 62-66 under 35 U.S.C. §103(a) as being unpatentable over Turtle (U.S. Patent No. 5,265,065) in view of Liddy et al. (U.S. Patent No. 6,006,221). In the Office Action the Examiner indicated that Turtle taught the steps of obtaining a set of relations, the relations including grammatical relations and case; identifying constituents in the first textual input that have the relations; and determining a relationship between the first textual input and the concept node of a document representation based on the constituents identified. The Examiner further indicated that Liddy taught a second textual

input that have relations. In particular, the Examiner indicated that the first two steps of claim 1 were taught in column 13, lines 20-36 of the Turtle reference. The cited section of the Turtle reference is reproduced below.

In the model illustrated in FIG. 6A, the phrase is treated as a separate representation content, independent of the contents corresponding to the component words. The belief in the phrase content can be estimated using evidence about component words and the relationship between them, including linguistic relationships. The presence of the query phrase concept in the document increases the probability that the document satisfies the query (or information needed). The model of FIG. 6 illustrates the case where the belief in the phrase concept depends on the belief in the concepts corresponding to the two component words. FIG. 6C illustrates a term dependence model where the phrase is not represented as a separate concept, but as a dependence between the concepts corresponding to the component words. A document that contains both words will more likely satisfy the query associated with the phrase due to the increase belief coming from the component words themselves. (See column 13, lines 17-36).

As can be seen from the above text of the Turtle reference, Turtle does not obtain a set of relations as defined in the Specification of the present invention, or as illustrated in claim 1 of the present invention. In the first step of claim 1 requires "obtaining a set of relations, the relations including grammatical relations or case." This is consistent with the definition of the term grammatical relations found on page 9 of the Specification. Grammatical relations are discussed on pages 5-6 and are, for example, grammatical identifications for the selected word such as subject, object, or prepositional phrase. Case information is described on pages 6-7 and is, for example, information such as part-of-speech, morphological inflections, and word boundaries. When presented with a textual input, the method of claim 1 first obtains the set of relations discussed

above and then breaks the textual input into parts and assigns a relation to each part of the textual input. Specifically, claim 1 takes the relations obtained in the first step and then performs the step of "identifying constituents in the first textual input that have the relations." This is illustrated at step 12 of FIG. 3A. Constituents are defined on page 17 of the Specification as, for example, noun phrases and verb phrases of the textual input. Thus, the second step creates an annotated constituent which contains information that can be used during later processing. The third step of claim 1 takes the annotated constituents and determines "the relationship between the first and second textual inputs based on the constituents identified."

This is in contrast with the disclosure of Turtle. In particular, Turtle only considers the relationship between words and a textual input once those words have been identified as part of a potential phrase of a parsed textual input. Further, Turtle identifies constituents after removing the stop words from the textual input. Once the stop words have been removed, Turtle then attempts to pair the remaining words as phrases. This pairing of phrases only occurs if the two words forming the phrase are in fact found in the phrase database. If the phrase is found in the phrase database, then the belief in the phrase content can be estimated using evidence about the component words in the relationship between the words. Therefore, it is clear to see from the disclosure of Turtle that the "constituents" of Turtle are formed prior to the obtaining of any "relations."

By way of example, because Turtle stems words and forms constituents prior to obtaining any relation, an exemplary input such as "independent of a contractor" is reduced to a second textual input of "independent" and "contractor". Then the analysis of the words is performed by Turtle. This results in the phrase "independent contractor" being considered by the system in Turtle, including the relationship between the words. However,

because the key markers of the prepositional phrase have been removed by the system of Turtle during the parsing process before a set of relations is obtained, much less considered, Turtle cannot assign the correct "relationship" between the two words. Thus Turtle identifies an incorrect relationship between these words.

In contrast the present invention obtains the relations before analyzing the textual input. Thus, the correct relationship between the words can be obtained. As neither Turtle nor Liddy teach or suggest obtaining a set of relations prior to identifying constituent words from the first textual input, it is believed that independent claim 1 is allowable over the cited references. Furthermore, it is believed that dependent claims 2-22 are allowable as well by virtue of their dependency either directly or indirectly from claim 1. Reconsideration and withdrawal of the rejection are respectfully requested.

Dependent claim 3 adds the additional limitation to claim 1 of obtaining a hierarchy of grammatical relations, and obtaining a hierarchy threshold based on a usefulness of the grammatical relations. The Office Action indicated that Turtle shows a hierarchy of grammatical relations in element 40 of FIG. 4, and obtains a hierarchy threshold based on a usefulness of grammatical relations in the hierarchy in determining the relationship between the first and second textual inputs is shown by element 44 of FIG. 4. Element 44 of Turtle does not show a hierarchy threshold based on the usefulness of grammatical relations. It shows the constituent words still in stemmed form, where some of the stemmed words are grouped as phrases. The words presented in element 44 of Turtle are in the same order as the stemmed words were presented in the original query language. Turtle does not consider the "relations" of these words and phrases in the formatted search query. Furthermore, each word presented in element 44 has the same relative importance when the

documents are searched for matches. Therefore, Turtle cannot determine the relative importance of each word in the list based on its grammatical relation. As Turtle does not teach or suggest the specific limitations of claim 3 it is believed that dependent claim 3 is allowable over Turtle. Furthermore, dependent claims 4-12 are believed allowable over Turtle by virtue of their dependency either directly or indirectly on allowable claims. Reconsideration and withdrawal of the rejection are respectfully requested.

Dependent claim 13 adds the additional limitation to claim 1 of obtaining a hierarchy of case information, and obtaining a hierarchy threshold based on the usefulness of a constituent having that case. Case information is defined at page 6-7 in the Specification as for example, part-of-speech, morphological inflections, and word boundaries. The Office Action indicated that this limitation was taught in column 15, lines 1-17 of Turtle. However, the section referred to by the Office Action shows returning results based on a partial phrase match, and not a hierarchy of case information. Nowhere in Turtle is it shown that the system considers case. Turtle is entirely dependent on the predefined phrase database, and the use of stemmed forms, which is the opposite of inflected forms. As Turtle does not consider the case information or the hierarchy of case information, it is believed that dependent claim 13 is allowable over Turtle. Furthermore, dependent claims 14-22 are believed allowable over Turtle by virtue of their dependency either directly or indirectly on allowable claims. Reconsideration and withdrawal of the rejection are respectfully requested.

Claim 23 recites a method for determining a relationship between first and second textual inputs including "analyzing the first textual input to obtain relations of constituents thereof." Further independent claim 23 requires determining a relative importance of the constituents in determining the relationship

between the first and second textual inputs based on the relations obtained, and determining the relationship between the first and second textual inputs based on the constituents and the relative importance of the constituents.

The Office Action indicated that the limitations of independent claim 23 were taught by the Turtle reference in combination with the Liddy et al. reference. However, as discussed above with regard to independent claim 1 and dependent claims 3 and 13, neither Turtle nor Liddy et al. rank constituents in any manner, and in particular do not rank the constituents based on their relations or relative importance. Furthermore, neither Turtle nor Liddy et al. determines a relationship between the first and second textual inputs based on the relative importance of the constituents. In fact, all Turtle does is present to the user the results of a comparison of documents based on the number of words in the search query that appear in the document as either individual words or phrases. All Liddy et al. does is present to the user documents in multiple languages that match the determined concept code. As neither Turtle nor Liddy et al. teach the limitations of claim 23, it is believed that independent claim 23 is allowable over Turtle. Furthermore, dependent claims 24-32 are believed to be independently allowable, independent of claim 23 because they are neither taught nor suggested by the references. Reconsideration and withdrawal of the rejection of claims 24-32 are respectfully requested.

Claim 33 requires that the plurality of constituents have a predetermined usefulness in determining the relationship based on relations of constituents in the textual material. As discussed above, neither Turtle nor Liddy et al. teach or suggest determining the usefulness of the constituents in determining the relationship between two textual inputs. Therefore, as neither Turtle nor Liddy et al. discloses a computer readable medium

having a plurality of constituents having a predetermined usefulness, it is believed that independent claim 33 is allowable over Turtle and Liddy et al. Furthermore, dependent claims 34 and 35 are believed to be independently allowable. Claim 34 is drawn to the index including syntactic structure indicative of a constituents' grammatical relation, and claim 35 requires that the usefulness is based on a portion of the grammatical relation along a hierarchy. Therefore it is clear that neither of these features are taught or suggested by the references. Reconsideration and withdrawal of the rejections of claims 33-35 are respectfully requested.

Claim 41 is directed to a computer readable medium storing a data structure used in determining a relationship between the first and second textual inputs. The data structure comprises a plurality of pre-computed aspects of at least one of the first and second textual inputs. The pre-computed aspects are useful in determining a relationship between the first or second textual inputs. Further claim 41 includes the additional limitation of that plurality of pre-computed aspects includes a linguistic analysis of at least a portion of the first and second textual input. Neither Turtle nor Liddy et al. teach or suggest the use of precomputed linguistic analysis as a factor in a data structure used in determining the relationship between first and second textual inputs. Therefore, it is believed that independent claim 41, is allowable over both Turtle and Liddy et al. Furthermore, claim 43 includes within the data structure a plurality of constituents wherein those plurality of constituents have a predetermined indication of usefulness. As discussed above, it is believed that neither Turtle nor Liddy et al. teach or suggest these limitations. Therefore it is believed that dependent claim 43 is independently allowable and is further allowable by virtue of its dependency from allowable independent

claim 41. Reconsideration and withdrawal of the rejection are respectfully requested.

Claim 62 is directed to a method for determining a relationship between the first and second textual inputs. The method comprises obtaining a hierarchy of relations, and obtaining a hierarchy threshold based on the usefulness of the relations. The method of claim 62 further comprises identifying constituents in the first textual input that have the relations in the hierarchy, and determining the usefulness of the identified constituents by locating the identified constituents in the hierarchy. Finally, the method of claim 62 determines the relationship between the first and second textual inputs based on the identified constituents having an associated relation above the hierarchy threshold. As discussed above with regards to claim 1 neither Turtle nor Liddy et al. teach or suggest a hierarchy of relations. Furthermore, neither Turtle nor Liddy et al. teach obtaining a hierarchy threshold based upon a usefulness of the relations in determining the relationship between the first and second textual inputs. Therefore, it is believed that independent claim 62 is allowable over both Turtle and Liddy et al. Reconsideration and withdrawal of the rejection are respectfully requested.

Dependent claims 63-66 are dependent from claim 1, and contain the additional limitations of obtaining case information based on the usefulness of a constituent having that case, and obtaining grammatical relation information based on the usefulness of a constituent having that grammatical relation. Claims 63-66 have the limitations of both dependent claims 3 and 13 for determining the relationship between a first and second textual input. As the limitations contained in both dependent claims 3 and 13 are recited in dependent claim 63, and dependent claims 3 and 13 are believed independently allowable over Turtle and Liddy et al. the combination of the limitations of claims 3

and 13 is allowable as well over Turtle and Liddy et al. Furthermore, it is believed that dependent claims 64-66 are independently allowable as well because the associated features are neither taught nor suggested by the references. Reconsideration and withdrawal of the rejection are respectfully requested.

In conclusion it is believed that claims 1-35, 41, 43 and 62-66 are allowable over Turtle and Liddy et al. Reconsideration and allowance of claims 1-35, 41, 43 and 62-66 are respectfully requested.

The Director is authorized to charge any fee deficiency required by this paper or credit any overpayment to Deposit Account No. 23-1123.

Respectfully submitted,

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